

TECHNICAL MEMORANDUM

Utah Coal Regulatory Program

March 12, 2007

TO: Internal File

THRU: Pamela Grubaugh-Littig, Permit Supervisor

FROM: Steve Christensen Environmental Scientist II

RE: 1st North Federal Lease Boundary Addition, CONSOL Energy Company, Emery Deep Mine, C/015/0015, Task ID # 2761

SUMMARY:

On September 12th, 2006, the Division of Oil, Gas and Mining (the Division) received an application from CONSOL Energy Company (the Permittee) outlining the addition of 160 acres to the current Emery Deep Mine permit area. The incidental boundary change (IBC) constitutes a significant mine plan revision and as such, requires Federal mine plan approval. On December 15th, 2006, the Permittee amended the application to reflect full extraction mining within the 160-acre addition. The Bureau of Land Management required the Permittee to revise their mining technique in order to achieve maximum economic recovery. In addition, the Permittee submitted an up-dated Probable Hydrologic Consequences Determination (PHC) document to reflect the proposed full-extraction mining impacts.

The proposed IBC area lies directly adjacent to the approved Emery Deep Mine permit area; specifically in the SW1/4 NW1/4, NW1/4 SW1/4, NE1/4 SW 1/4 and SE1/4SW1/4 of Section 22, T 22S, R 6E. It is located within the Christiansen Wash watershed, which is a perennial tributary to Quitchupah Creek. No definitive stream channels exist within the proposed IBC area. The underlying Ferron Sandstone member contains the coal horizon to be mined. The complete thickness of the Ferron Sandstone member is saturated with ground water.

The following is a hydrologic technical analysis as it relates to the State of Utah R645-Coal Mining Rules.

The proposed IBC amendment has addressed the hydrologic regulations as outlined in the aforementioned rules and should be adopted.

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TECHNICAL ANALYSIS:

GENERAL CONTENTS

PERMIT APPLICATION FORMAT AND CONTENTS

Regulatory Reference: 30 CFR 777.11; R645-301-120.

Analysis:

The application meets the General Content requirements for Permit Application Format and Contents as provided in R645-301-120.

Findings:

The information provided meets the hydrology requirements for Permit Application Format and Contents as provided in the R645-State of Utah Coal Mining Rules. The previous technical analysis had identified a deficiency based on a discussion of the UI and J coal zones on page 5 of Chapter XIII. The bottom of page 5 of the submitted Chapter XIII stated, "Based on data provided on Plate V-20 of the approved MRP, approximately 300 to 500 feet of overburden overlies the IJ zone within the IBC area". Upon inspection of the plates, Plate V-20 depicts the overburden of the UI zone. Plate V-19 depicts the J seam geology. The Permittee was asked to provide clarification.

The Permittee provided further discussion of the coal seams/zones on page 5 of Chapter XIII. Due to the wide variability of coal seam thicknesses in the permit area, the mining horizons at the Emery Deep Mine are typically referred to as zones rather than seams.

ENVIRONMENTAL RESOURCE INFORMATION

Regulatory Reference: Pub. L 95-87 Sections 507(b), 508(a), and 516(b); 30 CFR 783., et. al.

HYDROLOGIC RESOURCE INFORMATION

Regulatory Reference: 30 CFR Sec. 701.5, 784.14; R645-100-200, -301-724.

Analysis:

Modeling

The application meets the Environmental Resource Information requirements for Modeling as provided in R645-301-726. Per conversations with John Gefferth, Environmental Engineer with Consolidation Coal Company, a MODFLO model is currently being developed. On page 168 of the submittal, the Permittee commits to providing the Division with the MODFLO modeling results and calculations when they are completed.

Probable Hydrologic Consequences Determination

The application meets the Environmental Resource Information requirements for Probable Hydrologic Consequences Determination (PHC) as provided in R645-301-728. A new PHC determination was produced in lieu of the proposed full extraction mining to occur within the IBC area.

Beginning in Chapter VI on page 161, the Permittee discusses the probable hydrologic consequences of the proposed mining within the IBC area (assuming full extraction). The Permittee states, "with the exception of moderate sodium concentrations, analytical data obtained from the local rock and mine-water discharges indicate that no significant potential exists for the contamination of surface and ground water in the permit and adjacent areas by acid- or toxic-forming materials. Page 12 of Chapter XIII indicates that assuming that the total dissolved solids concentration of water discharging from the IBC area is similar to that in the remainder of the Emery Mine, and assuming that mining in the IBC area results in a slight increase in the mine-water discharge to Quitchupah Creek, the total salt load of Muddy Creek will increase by an insignificant amount.

Increases in sediment yield from disturbed areas will be minimal as no surface disturbance is planned with the proposed IBC expansion.

Water removed from the mine will be discharged to Quitchupah Creek, increasing the flow of this receiving stream. The PHC discusses that the Ferron Sandstone aquifer does provide base flow to Christiansen Wash and Quitchupah Creek within the permit area and adjacent areas. It is assumed that there will be local decrease to base flow for these drainages as a result of mining in the IBC area, however; due to several factors that affect the flow of these drainages (such as direct irrigation return flow of water originating in Muddy Creek, discharge from the Emery Mine and overland flow from precipitation runoff), the magnitude of these impacts is difficult to quantify. The impacts will likely be minimal as a result of mining in the proposed IBC area. Due to the cone of depression induced in the Upper Ferron Sandstone aquifer by previous mining activity, in all likelihood, the sandstone unit has already been partially dewatered.

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The submitted PHC provides a thorough discussion of the hydrogeologic setting. The Permittee discusses the Ferron Sandstone layers in detail including discussion as to the recharge and discharge areas of the geologic unit.

In addition, the revised PHC provides a thorough discussion as to the mine water discharge calculations that were performed in an effort to estimate future mine water discharge rates, taking into account full extraction mining. Two methods were utilized in an attempt to provide this estimate: the Freeze and Cherry equation and the Hantush equation. The Freeze and Cherry equation assumes that the mine acts as an infinitely long tunnel in a homogenous, isotropic porous medium. The Hantush equation assumes that the aquifer is homogenous, isotropic, pumped at a constant rate and is applied to large underground openings. The equations were utilized in an effort to provide estimates of the vertical mine-water inflow. By utilizing measured mine water discharge rates (See Figure VI-20A. Average Mine Water Discharge by Year), and assuming that water discharged from the mine during the shutdown period between 1991 and 2001 was equal to the amount of predominantly horizontal inflow to the mine, the Permittee estimated a value of 0.40 cfs for in-mine water usage. This value was calculated by taking the difference between average mine water discharges during the shutdown period (1991-2001) and the period following where mining resumed with two continuous miners (2002-2005). The Hantush equation estimates produced a much better correlation with measured mine-water discharge rates (See Table VI-23A). Calibrating the Hantush equation with measured discharge rates derived hydraulic conductivity rates for the aquifer. Based on the Hantush equation, and accounting for mine-water inflow and usage as discussed above, the Permittee has predicted mine-water discharge rates through the period of the current mine plan (2013). The results are summarized in Table VI-23B with an average predicted discharge rate of 1.50 cfs. The Division finds that these calculations and inherent assumptions are reasonable in predicting mine water discharge rates.

Findings:

The information provided meets the hydrology requirements for Hydrologic Resource Information as provided in the R645-State of Utah Coal Mining Rules.

MAPS, PLANS, AND CROSS SECTIONS OF RESOURCE INFORMATION

Regulatory Reference: 30 CFR 783.24, 783.25; R645-301-323, -301-411, -301-521, -301-622, -301-722, -301-731.

Analysis:

Subsurface Water Resource Maps

The application meets the Environmental Resource Information requirements for Subsurface Water Resource maps as provided in R645-301-722.100. Figure XIII-2 on page 9 of Chapter XIII and Plate VI-4 of the approved MRP depict the potentiometric surface of the Upper Ferron Sandstone within the proposed IBC area.

Surface Water Resource Maps deficient

The application meets the Environmental Resource Information requirements for Surface Water Resource maps as provided in R645-301-722.200. Plate VI-1, Location Map Surface Water Stations, depicts the surface water features within the approved permit area as well as in the proposed IBC area. Plate V-5, Subsidence Monitoring Points and Buffer Zones, depicts the buffer zones that will be established on perennial surface water features within the permit area. Plate V-3, Presubsidence Survey: Hydrology, depicts natural streams, dry washes and irrigation ditches located within the permit boundary and proposed IBC area.

Findings:

The information provided meets the hydrology requirements for Hydrologic Resource Information as provided in the R645-State of Utah Coal Mining Rules.

OPERATION PLAN

SUBSIDENCE CONTROL PLAN

Regulatory Reference: 30 CFR 784.20, 817.121, 817.122; R645-301-521, -301-525, -301-731.

Analysis:

Subsidence Control Plan

The application meets the Operational Plan requirements for Subsidence Control Plan as provided in R645-301-525.120, -525.480

Section V.B of the MRP discusses subsidence monitoring. Page 36 of the MRP outlines the steps and elements of the proposed subsidence-monitoring plan. The plan calls for the establishment of a series of reference points to be established outside the theoretical angle of draw. Item 1A on page 36 calls for a mine representative to inspect monthly the areas designated as "full extraction" on Plate V-5. The monthly inspections will continue until the survey monitoring points below indicate that there is no subsidence occurring. A record of the monthly inspections will be produced and forwarded to the Division. A copy of the inspection will also be kept at the mine office.

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In addition, the Permittee has committed to establish pre-mining elevations and gradients of any irrigation ditches and pond embankments within the angle of draw. The Permittee will also monitor these areas by visual inspection and post-subsidence ground survey to establish the effects of subsidence. The Permittee has committed to providing the Division with a quarterly subsidence mitigation report that describes the surface mitigation projects and their status broke down by surface landowner. The Permittee will also update the existing pre-subsidence survey and Plate V-3, Presubsidence Survey: Hydrology, six months prior to full extraction and provide copies to the surface landowner, the Division and the water conservancy, per R645-301-525.130.

Subsidence Mitigation

The application meets the Operational Plan requirements for Subsidence Mitigation as outlined in R645-301-525.480 relative to hydrology. Subsidence mitigation efforts are discussed on pages 39-42 of Chapter V of the approved MRP as well as on page 13 of Chapter XIII. Page 13 of Chapter XIII and pages 41 and 42 of the approved MRP generally discuss timetables and how the Permittee will negotiate with landowners regarding mitigation efforts. On page 39 of Chapter V of the approved MRP, the Permittee discusses the mitigation process relative to subsidence damage to structures and State appropriated water supplies. The Permittee commits to "restore, rehabilitate or remove and replace, to the extent technologically and economically feasible, each materially damaged structure, feature or value".

Page 41 in Chapter V of the MRP discusses subsidence mitigation. The Permittee states, "If subsidence occurs which prevents flow through a ditch that is used each summer, then it will be necessary to repair the ditch as soon as practical even though future subsidence may necessitate further work". In addition, the mine has been designed to preclude subsidence in areas occupied by perennial streams. The Permittee has produced a plan to prevent subsidence from affecting Quitchupah Creek, Christiansen Wash and the alluvial valley floor area on the west side of the permit area by establishing buffer zones in these areas. Plate V-5, Subsidence Monitoring Points and Buffer Zones, depicts a stream buffer zone extending the full length of Christiansen Wash in the areas where full extraction mining will take place. Additionally, a buffer zone has been established in the alluvial valley floor area around Quitchupah Creek. The overburden depth and the angle of draw were used to determine the buffer zone dimensions. The buffer zone for Quitchupah Creek and Christiansen Wash includes an additional standoff distance of 100 ft. on either side.

The Permittee provides a commitment to "repair or replace any adversely affected State appropriated water supplies that are contaminated, diminished or interrupted" as required by R645-301-731.530 on page 41 of Chapter V of the MRP.

On page 13 of the newly submitted Chapter XIII, the Permittee states, "The pre-subsidence survey will be updated on all surface areas depicted on Plate V-5 prior to secondary

mining. If the irrigation system is still functional at the time of subsidence, Consol will visually inspect the irrigation system before and during the growing season.”

Findings:

The information provided meets the hydrology requirements for Subsidence Control Plan and Mitigation as provided in the R645-State of Utah Coal Mining Rules.

HYDROLOGIC INFORMATION

Regulatory Reference: 30 CFR Sec. 773.17, 774.13, 784.14, 784.16, 784.29, 817.41, 817.42, 817.43, 817.45, 817.49, 817.56, 817.57; R645-300-140, -300-141, -300-142, -300-143, -300-144, -300-145, -300-146, -300-147, -300-147, -300-148, -301-512, -301-514, -301-521, -301-531, -301-532, -301-533, -301-536, -301-542, -301-720, -301-731, -301-732, -301-733, -301-742, -301-743, -301-750, -301-761, -301-764.

Analysis:

General

The application meets the Operational Plan requirements for General Hydrologic information as provided in R645-301-731.

The Permittee provides surface and ground water information on pages 7-10 of the submitted Chapter XIII. The coal to be mined is located within the upper portion of the Ferron Sandstone. The Permittee states the “complete thickness of the Ferron Sandstone is probably saturated within the IBC area, normally under confined conditions”. Figure XIII-2, Upper Ferron Sandstone Potentiometric Surface, 2004/05 on page 6 of Chapter XIII does depict the potentiometric surface of the Upper Ferron Sandstone layer equal to or above the topographic surface within a portion of the proposed IBC area. The Permittee discusses the recharge and discharge areas of the Upper Ferron Sandstone layer and indicates that the dewatering of the Emery Mine represents the largest anthropogenic discharge of groundwater from this geologic unit. Groundwater chemistry is discussed on page 5 of the submitted Chapter XIII.

On page 7 of the submitted Chapter XIII, the Permittee discusses the surface water within the IBC area. Flow characteristics of the Christiansen Wash are discussed. In addition, the water chemistry of Christiansen Wash is presented on page 7 as well.

Groundwater Monitoring

The application meets the Operational Plan requirements for Groundwater monitoring as provided in R645-301-731.210. The Permittee does not propose any additional ground water monitoring within the proposed IBC area. As stated on page 5 and presented in Figure XIII-2 of

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Chapter XIII, the upper Ferron Sandstone layer within the proposed IBC is essentially saturated with ground water. Plate VI-3 of the approved MRP depicts several ground water monitoring wells within the area immediately adjacent to the proposed IBC area. In light of the broad effects of mining on ground water levels in the permit and adjacent areas, the current spacing of monitoring wells in the vicinity of the proposed IBC is adequate. The Permittee has indicated that exploratory drilling will take place in the area adjacent to the proposed IBC and that if ground water is encountered, they would consider converting some of those drill holes into ground water monitoring wells if deemed necessary.

Surface Water Monitoring

The application meets the Operational Plan requirements for Surface Water monitoring as provided in R645-301-731.220. The Permittee does not propose any additional surface water monitoring within the proposed IBC area. In light of the fact that there are no perennial or intermittent sources of water within the IBC area (See Plate V-3), additional surface water monitoring is unnecessary.

State Appropriated Water Rights

The application meets the Operational Plan requirements for State Appropriated water supply as provided in R645-301-731.530.

In Chapter VI, 1 of 2, the Permittee provides water right information that includes the proposed IBC area beginning on page 139 and continuing through page 143. Muddy Creek Irrigation Company holds 12 water user claims (94-2, 94-12, 94-32, 94-33, 94-40, 94-47, 94-55, 94-56, 94-57, 94-793, 94-1134 and 94-1135) either within the proposed IBC area or adjacent to it. The water rights are primarily utilized for irrigation purposes.

In Appendix V-3 of Chapter V (2 of 3), the Permittee provides a presubsidence survey. The survey identifies hydrologic resources within the proposed IBC and adjacent area. The survey identified a network of irrigation ditches (item #93 in the survey) as well as a series of ponds (item #90 in the survey). These ditches and ponds constitute the irrigation network for the Muddy Creek Irrigation Company within the proposed IBC area.

Stream Buffer Zones

The application meets the Operational Plan requirements for Stream Buffer Zones as required in R645-301-600. The Permittee has produced a plan to mitigate the effects of subsidence on Quitcupah Creek, Christiansen Wash and the alluvial valley floor area on the west side of the permit area by establishing buffer zones in these areas. Plate V-5, Subsidence Monitoring Points and Buffer Zones, depicts a stream buffer zone extending the full length of Christiansen Wash in the areas where full extraction mining will take place. Additionally, a

buffer zone has been established in the alluvial valley floor area around Quitchupah Creek. The overburden depth and the angle of draw were used to determine the buffer zone dimensions. The buffer zone for Quitchupah Creek and Christiansen Wash includes an additional standoff distance of 100 ft. on either side.

Water-Quality Standards And Effluent Limitations

The application meets the Operational Plan requirements for Water Quality Standards and Effluent Limitations as provided for in R645-301-722.2. The Permittee operates under a UPDES discharge permit issued by the Utah Division of Water Quality and controls discharges from the mine to be consistent with that permit.

Acid- and Toxic-Forming Materials and Underground Development Waste

The application meets the Operational Plan requirements for Acid- and Toxic- Forming Materials and Underground Development Waste as provided in R645-301-731.300. The Permittee discusses the potential for acid- or toxic-forming materials in the revised PHC document on page 161.

Information concerning acid-and toxic-forming materials in rock at the Emery Mine is presented in Sections V.A.4 through V.A.6 of the MRP. The pH of roof and floor materials ranges from 5.0 to 9.1, with the acid-base potential indicating a net base potential. The alkaline nature of the system is further indicated by the fact that the pH of ground water in the area is typically in the range of 7.0 to 9.5 (see Section V.A.2.7).

Findings:

The information provided meets the hydrology requirements for Hydrologic Information as provided in the R645-State of Utah Coal Mining Rules.

RECLAMATION PLAN

GENERAL REQUIREMENTS

Regulatory Reference: PL 95-87 Sec. 515 and 516; 30 CFR Sec. 784.13, 784.14, 784.15, 784.16, 784.17, 784.18, 784.19, 784.20, 784.21, 784.22, 784.23, 784.24, 784.25, 784.26; R645-301-231, -301-233, -301-322, -301-323, -301-331, -301-333, -301-341, -301-342, -301-411, -301-412, -301-422, -301-512, -301-513, -301-521, -301-522, -301-525, -301-526, -301-527, -301-528, -301-529, -301-531, -301-533, -301-534, -301-536, -301-537, -301-542, -301-623, -301-624, -301-625, -301-626, -301-631, -301-632, -301-731, -301-723, -301-724, -301-725, -301-726, -301-728, -301-729, -301-731, -301-732, -301-733, -301-746, -301-764, -301-830.

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Analysis:

The application meets the Reclamation Plan requirements for General Requirements as provided in R645-301-760. Page 10 of the submitted Chapter XIII discusses the reclamation plan for the proposed IBC area. The proposed IBC expansion plan does not propose any new surface disturbances as a result of mining. As such, no additional land reclamation will be required.

Findings:

The information provided meets the hydrology requirements for Reclamation Plan as provided in the R645-State of Utah Coal Mining Rules.

CUMULATIVE HYDROLOGIC IMPACT ASSESSMENT

Regulatory Reference: 30 CFR Sec. 784.14; R645-301-730.

Analysis:

The application meets the Reclamation Plan requirements for General Hydrologic information as provided in R645-301-731. Page 10 of the Chapter XIII submittal discusses the cumulative hydrologic impact assessment. The proposed IBC area lies within the existing cumulative hydrologic impact assessment area associated with the Emery mine.

Findings:

The information provided meets the hydrology requirements for Cumulative Hydrologic Impact Assessment as provided in the R645-State of Utah Coal Mining Rules.

RECOMMENDATIONS:

The submittal should be approved at this time.